CLAIMS

1. – 70. (CANCELLED)

71. (NEW) A method of estimating blood perfusion indices, for a region of interest (ROI) by operating a computer program on intensity data input to a computer comprising:

a. providing a contrast agent to an artery, wherein said artery is upstream from a region of interest (ROI), wherein said ROI comprises tissue;

b. measuring intensity data to provide a tissue contrast agent curve $C(t)$ in said tissue, wherein said C(t) is a known intensity profile measured against time;

c. measuring an arterial input function $AFT_a(t)$ in a vessel leading to said ROI, wherein said $AFT_a(t)$ is known intensity profile measured against time;

d. determining a tissue blood flow F_t and a tissue impulse residue function R(t) by deconvolving $C(t) = (F_t / k_H) AIF_a(t) \otimes R(t)$, wherein $k_H = (1 - H_a)/(1 - H_t)$ is a correction constant using different values of an arterial hemotaocrit H_a and a tissue hematocrit H_t, wherein said H_a has a value of about 0.45, wherein said H_t has a value of about 0.25, wherein when said $AFT_a(t)$ in a major artery comprises no delay and no dispersion, said C(t) can be derived by a convolution of said $AIF_a(t)$ and said R(t);

e. determine a blood flow rate F_t and a tissue impulse residue function $R_e(t)$ using a said C(t) and said AIF_t by deconvolving the relation $C(t)= (F_t/k_H)AIF_t(t) \otimes R_e(t)$, wherein k_H is a hermocrit correction constant having a known value;

f. measuring an arterial input function $AIF_a(t)$ in said artery at a position that is upstream from said tissue;

g. simulating a tissue contrast agent concentration curve $C_s(t)$ using a vasucular

transport function $h_a(t)$, and a tissue transport function $h_s(t)$, wherein said $h_s(t)$ is given by a Gaussian probability density function, wherein said $h_s(t)=\frac{1}{A_2}(t-t_2)^{\alpha_2}e^{-(t-t_2)/\sigma 2}$ for t ≥ t_2, and said $h_s(t)$= 0 for t < t_2, and $h_s(t)=\frac{1}{A_2}(t-t_2)^{\alpha_2}e^{-(t-t_2)/\sigma 2}$ for t ≥ 0, wherein said σ_2 and α_2 are parameters related to mean transit time and dispersion of said $h_s(t)$, wherein ($\sigma_2 * \alpha_2$) is a peak rise time, wherein $\sigma_2(1 + \alpha_2)$ is a mean transit time, wherein for said α_2, wherein when said $\alpha_2 = 0$, said $h_s(t) = \frac{1}{\sigma_2}e^{-(t-t_2)/\sigma 2}$ for t≥ t_2, and said $h_s(t) = 0$ for t < t_2, wherein $1/\sigma_2$ is a peak height, wherein $t_2 + \sigma_2$ is a mean transist time (τ) in said tissue;

h. using an adiabatic approximation to a homogeneity model in said tissue to provide a tissue input residual function R (t, τ), wherein for t ≤ τ, said R (t, τ) = 1, wherein fro t > τ, said R (t, τ) = $Ee^{-k(t-\tau)}$, wherein E is an extraction fraction of said contrast agent in said blood that leaks out of a vessel into said tissue, wherein k is a clearance rate at which said contrast agent diffuses back into said blood and leaves said tissue, wherein said k = $E*F_t/V_e$, wherein said V_e us a volume fraction of extravascular space and extracellular space in said tissue, wherein said E comprises a value between 0 and 1, wherein said V_e comprises a value between 0 and 1;

i. providing in average tissue input residue function $R_s(t)$, wherein said $R_s(t)$ comprises a Gaussian probability density function $h_s(t)$ of a contrast agent,

wherein $R_s(t) = 1 - \int_0^t h_s(\tau)d\tau + Ee^{-kt}\int_0^t h_s(\tau)e^{k\tau}d\tau$;

j. determining a simulated contrast agent curve $C_s(t)$, wherein said $C_s(t)$ is reperesented by $C_s(t) = (F_t / k_H) AIF_t(t) \otimes R_s(t) = (F_t / k_H)\int_0^t AIF_t(\tau)R_s(t-\tau)d\tau$;

k. using an iterative least squares method to fit the said simulated $C_s(t)$ to said measured tissue curve C(t) with four adjustable parameters;

l. using a model-free deconvolution method to estimate starting values of said adjustable parameters for said iterative least squares fitting process in order to derive optimized values of said adjustable parameters; and

m. calculating perfusion indices from the said optimized values of the adjustable parameters.

72. (NEW) The method of claim 70, wherein said intensity data is generated by administering a contrast agent to a body lumen of a body during a dynamic imaging scan, wherein said body lumen comprises an artery or a vein, wherein an image response from said contrast agent is recorded to computer data storage in a computer.

73. (NEW) The method of claim 70, wherein said C(t) is a temporal concentration of said contrast agent obtained from said intensity data, wherein said intensity data comprises contrast images sequentially acquired from a region in a body, whereby said contrast agent concentration is plotted versus time.

74. (NEW) The method of claim 70,wherein said AIF_a is scaled upward according to a venous input function (VIF), wherein said VIF is based on a measured contrast intensity profile from a vein draining from said ROI.